ture, the high speed of the cars (going much faster than the cables), the easy motion of the car, the freedom from jerking and lack of danger elements, fully attest the wisdom displayed.

The cars as now equipped are able to tow additional cars, their equipment being of sufficient power. They have fully demonstrated their efficiency in many instances; in one case having pushed the Avondale cars up the 7½-per-cent May Street grade when the horses were stalled from overloading, and in another pushing the heavy cable-trains back upon the track at a recent occurrence.

The performance of regular commercial service by these Daft motor cars over a road upon which there are not over six hundred feet of straightaway track (in one mile there being six cross-overs, eight curves, and grades as high as 7½ per cent, travelling for a portion of the road over a regular cable-line), and the ease with which they are able to run away from the cable-cars, mounting grades continuously wet by street-sprinkling carts, demonstrate that the Daft system in Cincinnati has scored a complete success, and justifies the confidence reposed in it by the managers of the street-railway company.

Praises for the manner of its construction, its equipment, and its operation, are heard everywhere. One of the most remarkable features about this line is the double underneath contact trolley. It requires no attention from driver or conductor: in fact, were it not for the ordinances requiring a conductor to each car, his services would be wholly unnecessary. The trolley moves with the same ease as the car upon the track, and its liability to leave the wires is very much less. Its construction is such that it regulates itself to all the various dips, angles, curves, etc., with the greatest facility.

Another important feature of the Daft system is its great economy.

The power is taken from the engine which drives the Gilbert Avenue cable, and so some fluctuation of speed in the generator results, but not sufficient to interfere in any way with the successful operation of the electric road.

Half-hourly records are kept of voltmeter and ammeter readings, the dynamo speed, and the temperature of the engine-room. From these it can readily be seen when the car is ascending grades, when descending, when at grade, when with more than an ordinary load, etc. At the dynamo station it is practicable to tell at any hour of the day the relative position of the cars to the line. Power is only absorbed by the motors upon the car to meet the requirements made upon it by their several loads. Of course, under such circumstances, when there is no demand for power, there can be no expenditure, and the result is the highest economy. It is usual with street-railway people to base the success of any system, whether it be by horses, by cable, or by electricity, upon the dollar-and-cents basis. In this respect the Daft system recommends itself to thoughtful business-men.

INSECTICIDES AND THEIR APPLICATION.

As the season of the annual warfare between vegetable life and its insect enemies has come round once more, our readers will probably find interesting a report on insecticides recently published by the Ohio Agricultural Experiment Station. The director of the station states that insecticides, or the substances used for destroying insects, may broadly be divided into two classes: (1) internal poisons, or those which take effect by being eaten along with the ordinary food of the insect; and (2) external irritants, or those which act from the outside, closing the breathing-pores, or causing death by irritation of the skin. Besides these, however, various other substances are used in preventing insect-attack, keeping the pests away because of offensive odors, or acting simply as mechanical barriers.

The most important insecticides are the poisons. Of these the most popular are the various combinations of arsenic, known as "Paris green," "London purple," "slug-shot," and a large number of patent insecticides sold under various names.

Paris green is a chemical combination of arsenic and copper, called arseniate of copper. It contains about fifty-five or sixty per cent of arsenic, and retails at about thirty cents per pound. It is practically insoluble in water, and may be applied either dry or wet. In the former case it should be well mixed with some fine powder as a diluent: plaster, air-slacked lime, flour, road-dust, and finely sifted wood-ashes, all answer the purpose fairly well, though lime or plaster is usually preferable. The proportion of poison to diluent varies greatly with different users: one part poison, to fifty, and even one hundred, of diluent, will usually be effective, if the mixing be thoroughly done. In the wet mixture for fruit and shade trees, use one pound poison to 150 gallons water, and keep well stirred. The chief objection to Paris green is that it is so heavy that it settles quickly to the bottom of the vessel, — very much more quickly than London purple. It is also more expensive.

London purple is a by-product in the manufacture of aniline dyes, produced by Hemingway's London Purple Company of London, England. It contains nearly the same percentage of arsenic as Paris green, and is much cheaper, retailing at about fifteen cents per pound. It is a finer powder than the green, and consequently remains in suspension much longer. It may be used in the same way, — as a powder or in water, — and the proportions given above answer very well for it.

White arsenic is sometimes recommended as an insecticide, but fortunately is rarely used. It is much more dangerous to have around than either of the above highly colored compounds, and in practice is very liable to burn the foliage to which it is applied.

The principal substances used for killing insects, by contact, are the following: —

Hellebore is a powder made of the roots of a plant called white hellebore (*Veratrum album*). It is a vegetable poison, but much less dangerous than the mineral arsenical poison, and kills both by contact and by being eaten. It may be applied as a dry powder or in water (an ounce to three gallons). It retails at about twenty-five cents per pound, and is especially excellent for destroying the imported currant-worm.

Pyrethrum is an insecticide of recent introduction, made from the powdered flowers of plants of the genus *Pyrethrum*. There are three principal brands upon the market, known as "Persian insect-powder," "Dalmatian insect-powder," and "buhach," the last being a California product. The greatest obstacle to the use of pyrethrum has been the difficulty of obtaining the pure, fresh article. If exposed to the air, the poisonous principle volatilizes, and the powder is worthless: hence dealers should purchase a fresh supply each season, and should keep it in air-tight vessels. Pyrethrum is used mainly either as a dry powder or in water (one ounce to three gallons), but may also be used in the form of a tea or a decoction, a fume, or an alcoholic extract diluted. For use as a dry powder, it may advantageously be diluted with six or eight parts of flour. It is especially excellent for clearing rooms of flies and mosquitoes, and for killing the common cabbage-worms. It is practically harmless to man and the higher animals.

Kerosene emulsion is made by adding two parts of kerosene to one part of a solution made by dissolving half a pound of hard soap in one gallon of boiling water, and churning the mixture through a force-pump with a rather small nozzle until the whole forms a creamy mass, which will thicken into a jelly-like substance on cooling. The soap solution should be hot when the kerosene is added, but of course must not be near a fire. The emulsion thus made is to be diluted, before using, with nine parts cold water. This substance destroys a large number of insects, such as the chinch-bug, cabbage-worm, and white grub, and is a comparatively cheap and effective insecticide. Besides its use as an emulsion, kerosene alone is frequently used for various pests. It is especially valuable in destroying vermin on domestic animals and in hen-houses.

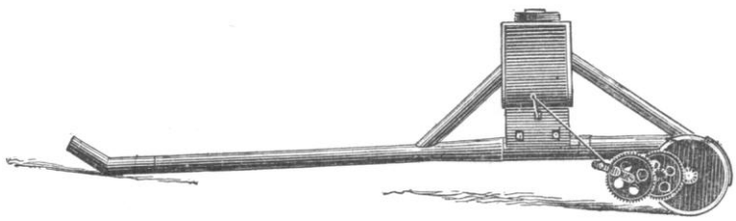
Carbolic acid, especially in its crude state, is valuable for various insecticidal purposes. An excellent wash for preventing the injuries of several tree-borers is made by mixing one quart soft soap, or about a pound of hard soap, with two gallons water, heating to boiling, and then adding a pint of crude carbolic acid. Carbolic-acid soaps are largely used for destroying vermin on domestic animals.

Tobacco is a very valuable insecticide for use against vermin on domestic animals and green-house pests. It may be used in the form of a decoction, a smoke, or dry. The refuse stems from the

cigar-factories are generally easy to obtain, and, if fresh, are effective in destroying the pests mentioned.

Bisulphide of carbon is a volatile substance used for destroying grain insects, ants, the grape phylloxera, and other insects which may be reached by a vapor. It is inflammable, and should never be used in the vicinity of a fire. Benzine is another volatile substance, used for much the same purposes as the last. Gasoline may also be mentioned in the same connection.

Coal-tar has been largely used in the West for destroying Rocky Mountain locusts, being placed on flat pans, on which the insects jump and are caught. It is also employed to prevent the migrations of the chinch-bug. A shallow V-shaped channel is made with the corner of a hoe along the borders of the field to be protected, and tar poured in. So long as the tar does not dry out, the immature chinch-bugs cannot cross it.



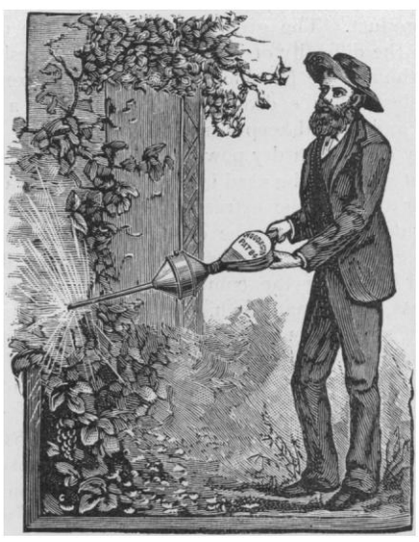
LEGGETT'S POWDER-GUN.

Lime and plaster are excellent for use in preventing the depredations of certain insects. Plaster may be dusted on melon and other vines to drive off flea-beetles; and fresh-slacked lime may be dusted or sprayed (a peck to fifty gallons of water) on grapes, peaches, etc., to prevent rose-beetle injuries. Gas-lime is sometimes recommended as an insecticide, but seems to be little used in America. It is valuable as a fertilizer, and can be obtained at little cost.

Soluble phenyl and paraffine-oil are two English insecticides frequently recommended for trial here, but which are as yet little used. For the following facts concerning the newer inventions for the application of insecticides we are indebted to Peter Henderson & Co., seedsmen of this city.

The enormous damage done by insects to our fruits, vegetables, grain, etc., is almost beyond belief, — amounting, it is claimed by competent authorities, to from $200,000,000 to $250,000,000 per annum in the United States alone, — and their ravages are steadily increasing. Fortunately the extensive experiments in insecticides and implements for applying them enable us to fight them so well that the damage done is scarcely felt when the most is made of our opportunities; but it is absolutely necessary that the first attacks of the ravenous little creatures be promptly met. Do not delay a single day, for they increase in numbers with marvellous rapidity; and one day is sufficient for millions of eggs to be laid, to reproduce in a short time larger hosts, even should we be successful enough to destroy the original advance guard. Promptness in this will save one-half the trouble and expense later on. In applying insecticides, it should be borne in mind that "a little is as good as a feast." It is not necessary to drown the insects with solutions, or to bury them with powder, to kill them, — the least particle of poison is sufficient to do its deadly work, — but it is necessary that "the least particle" and the insect come in contact. It is much better to reach every portion of the plant or tree, underneath as well as above, with a fine spray of fluid or a slight dusting of powder, than to apply liberally in some parts and carelessly overlook others, as is the too general custom. To fight insects effectually, it must be done thoroughly, and every inch must be covered. Besides, there is much less danger of burning or injuring the leaves and fruit by light applications.

The recently improved implements for applying powders or fluids are great economizers, covering larger surfaces with less material, doing it with greater speed, and reducing the danger of injury to plants to a minimum. Among them we will mention



DOUBLE-CONE POWDER-BELLOWS.

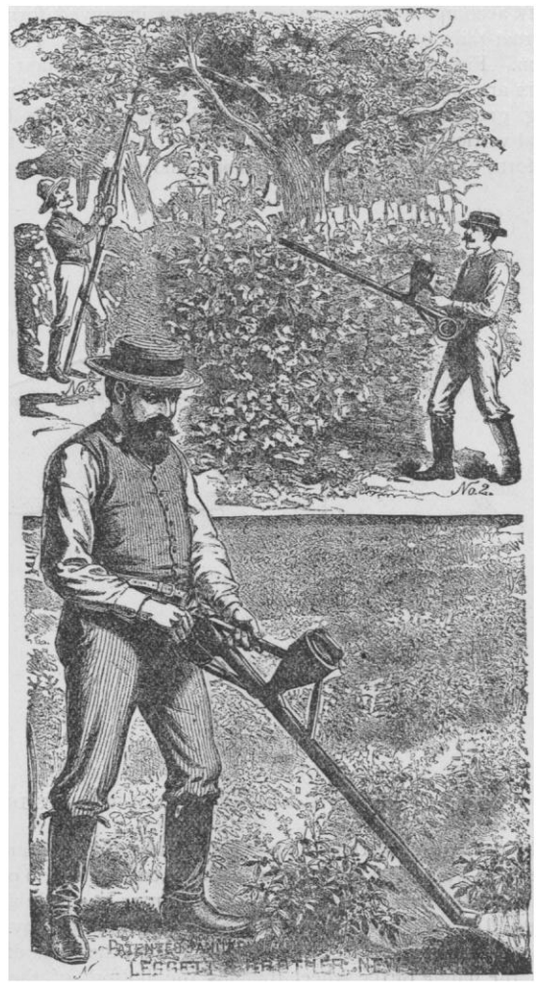
VAPORIZING-BELLOWS.

Leggett's powder-gun, in which a rapidly revolving fan-wheel blows the powder through a long tin tube with such force that it is widely and lightly distributed over a large surface. Sectional tubes can be added, so the powder will go up into the tallest fruit-trees; and, as the under side of the leaves are reached as well as above, it is an exceedingly effectual implement. A short curved tube comes with it for applying powders to low-growing plants, by which the under side of the foliage is reached as well. The supply of powder can be regulated to such a nicety, that Mr. Leggett claims he can make half a pound of London purple cover an acre. Woodason's improved double-cone bellows is also worthy of special mention. It is impossible to clog it, as a series of perforated tubes

run through the powder-chamber, keeping the powder constantly stirred up; and, no matter in what position it is held, the same regular supply is blown out. A detachable spout enables the operator to blow up under the foliage of vines and potatoes without stooping and getting into tiresome positions.

For applying fluids, there is an ingenious device nearly ready to be put on the market, which looks not unlike a Babcock fire-extinguisher. It is carried on the back of the operator, which enables him to carry twice the quantity of fluid with greater ease than by the old method, with a bucket. But its great merit lies in the fact that the fluid is forced out by compressed air, through two short pieces of hose, which are held in each hand, enabling two rows to be easily covered at a fair walk. The fluid can be applied in the form of mist, spray, or stream, at will; and, when the air has been exhausted, a few movements of the small pump-handle are sufficient to recharge it. Vaporizing-bellows are also exceedingly valuable for applying solutions of alcohol, kerosene, fir-tree oil, and other insecticide solutions of like character, which are such thorough insect-exterminators, but so dangerous to the plant when carelessly applied by syringe or sprinkler. With the vaporizing-bellows, these strong fluids can be applied almost like vapor, and the insects are killed without danger to the plants. Some of the newer spraying-pumps for orchard and field use are a step in the right direction. A "return discharge" is added, the mouth of which can be placed near the suction-pipe at the bottom of the barrel; and it keeps the solution thoroughly churned and mixed, as no stirring with a stick can do. When kerosene emulsion, fir-tree oil, or other oily insecticide is used, which rises naturally to the surface, the mouth of the return discharge should be placed on or over the surface. Kerosene, when intelligently applied, is a valuable remedy. We know of its being used, to the exclusion of all other insecticides, in greenhouses containing the rarest plants; and brighter, cleaner, healthier stock we never saw. But it is used with discretion. On woody and hardier plants, such as camellias, palms, azaleas, etc., one pint of kerosene to four gallons of water is used; and for delicate-foliaged plants, from one-third to one-half less kerosene is used. When applying the solution, one man is constantly drawing and forcing the fluid back through a syringe into the bucket, while another fills his syringe with the thoroughly churned solution, and applies it to the plants: therefore these return-discharge pumps are gotten up to work on the same correct principle as that of the two men just described, for applying not only kerosene, but London purple and Paris green poisoned waters as well; for these two powders are not soluble, and soon settle to the bottom, leaving the surface water too weak, and that at the bottom so strong that the foliage is likely to be injured.

Insect-killing powders are much more efficacious when blown into the plant than when dusted on, as is the usual practice. When blown on with a bellows or other implement, the powder separates into clouds of impalpable dust; and the force causes it to penetrate the innermost crevices, destroying the hidden insects and larvæ by filling their breathing-pores (which, as all know, are situated in rows on each side of their bodies), thus suffocating them. This is the main reason why non-poisonous powders are frequently as effectual as poisonous. We know of a firm of large cabbage-growers in Florida who have saved their crops for several years, while their neighbors' have been almost a total loss, simply by blowing Persian insect-powder of *high grade* into each plant with a finely-distributing bellows. Their men go over the fields occasionally, not stopping to see whether a cabbage is affected or not, and simply puff a small quantity of powder into each in a rapid, business-like manner; and the result speaks for itself. You will notice that we emphasize "high grade" in connection with the Persian powder. We do so, because the cheap grades are almost worthless. The "high grade infallible" is produced from the half-opened flowers and buds of *Pyrethrum roseum* or its hybrids, that from the collected wild flowers being superior to the cultivated; while the cheaper grade is made from opened flowers gathered later in the season, with frequently the flower-stems ground in; and lots of useless cheap stuff is sold which is made from the stalks and stems of the plant, ground and colored so finely that to the uninitiated it appears better than the superior grades. The insect-destroying properties of the Persian powder depend largely on the fineness to which it is ground, enabling it to penetrate the breathing-pores of the insect, and on its resinous properties causing it to adhere and suffocate them. This resinous property is easily injured by exposure, and generally entirely destroyed by dampness. Dalmatian powder and buhach are made from the same family, grown in other sections of the world, the former being from Dalmatia, and the latter from California. All are equally good if the flowers are gathered at the proper stage and thoroughly ground. Persian powder has been considered superior, simply because it was formerly made under the supervision of the Hungarian Government, who exacted purity and other conditions which insured a high grade, which gave the powder its reputation. The pyrethrum



LEGGETT'S POWDER-GUN IN OPERATION.

grown in California has been proved to be equally as efficacious, when correctly prepared, as that from the Caucasian Mountains; the climatic conditions of the latter having no superior influence, as is generally supposed.

In poisonous powders, London purple is rapidly taking the lead. It is largely used in the public parks and in government experimental farms, and is considered superior to Paris green on account of being more soluble, there being less danger of burning the foliage with it. It is said to go further, and is certainly much cheaper, which is accounted for by its being a by-product. When used as a powder, it also has the advantage of being more readily seen on the plants. The adulterants usually mixed with it are either land-plaster, road-dust, plaster-of-Paris, or cheap flour; and it is advisable to mix thoroughly at least twenty-four hours before use, which allows the adulterant to absorb the poison, making it more effectual. Where small areas only have to be gone over, flour is the best, as it adheres tenaciously to the foliage, and it is more inviting to the insectivorous appetite than minerals. When mixed with flour, one pound of London purple to twenty to thirty pounds

of flour is the proper proportion, according to the tenderness of the plants; mixed with land-plaster or plaster-of-Paris, one pound of the poison to a hundred and fifty pounds of the adulterant; with dry road-dust, one pound of the poison to a bushel and a half of the dust. In making liquid solutions, mix one pound of London purple with two hundred gallons of water, but first wet the powder and form a thin paste to prevent it from forming lumps. It should be put in the water twelve hours at least before use, for the best results. Paris green can be mixed in the same proportions, and in the same manner, as above.

WHITE'S STREET-RAILWAY RAIL AND CHAIR.

THE accompanying illustrations show an improved form of rail for street-railways, designed and manufactured by R. T. White of Boston. Fig. 1 shows the rail in section. Two pendant sides or girders are rolled integral with the top or tread of the rail, thus giving greater strength than the ordinary girder-rails having a central vertical rib. This rail has many advantages over the common form of tram or girder rails, being easier to lay and pave to; and the paving, on settling, cannot drop under the head and flange of the rail, — a very serious defect with the common form of girder-rails. The top or wearing part of this rail may be made as shown by the full or dotted lines; but, by making it as shown by the full lines, more wearing surface can be obtained on the head of the rail before the flange of the wheel touches the bottom of the groove. Carriage-wheels can easily pass over or out of this rail, and the groove cannot become clogged, as the flange of the car-wheel acts as a wedge as it passes along, forcing stones or dirt out of the way.

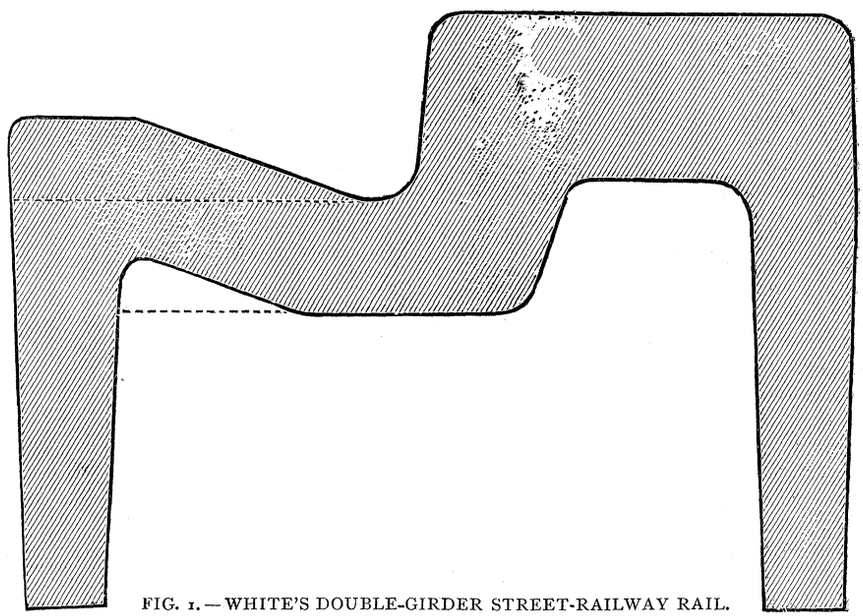


FIG. 1. — WHITE'S DOUBLE-GIRDER STREET-RAILWAY RAIL.

Fig. 2 shows the method of laying the new rail. It is secured on a chair by a bolt passing through the pendant sides of the rail and through the upper end of the chair. These chairs are placed at suitable intervals along the rails, and a similar chair of sufficient length is used at the ends, for connecting the rails together, thus making a substantial and practical joint. The chairs are set on and secured to wooden sleepers by lag screws, as shown; but the wooden sleepers may be dispensed with by enlarging the base of the chairs sufficiently to give them a solid bearing when tamped in the ground, or they may be set in concrete. In this case, tie-rods would be used to hold the rails to gauge.

FROM 1877 to 1888, forty-nine cases of leprosy have been treated at the St. Petersburg hospitals. About one-half of these are reported to be of subjects born in the city proper. Of the others, some come from the Baltic provinces, but there are also a few from districts where hitherto leprosy has been unknown.

ROYAL SOCIETY OF CANADA.

THE seventh annual meeting of the Royal Society of Canada took place in Ottawa on Tuesday, May 7. From the secretary's report, it seems that the delay in the appearance of the "Transactions of the Society" was caused by the incomplete nature of many of the papers. Four vacancies were filled during the year, — three in the English section, and one in the mathematical. In 1887 a committee was appointed to consider the proposition of taking steps in the direction of an imperial union of the services of similar societies, in connection with the Imperial Institute, to co-operate in developing and illustrating the resources of the empire. A favorable report having been returned, the committee was further instructed to communicate on the subject with the authorities of the Imperial Institute.

Delegates from affiliated societies were introduced, representing the Society of Canadian Literature, the Natural History Society, the Numismatical and Antiquarian Society, the Society for Historical Study, the Literature and History Society, the Geographical Society, the Quebec Institut Canadien, the Ottawa Institut Canadien, the Field Naturalist Club, the Entomological Society, the Toronto Canadian Institute, and the Nova Scotia Historical Society.

Mr. Sandford Fleming, in his presidential address, touched on the fact, that, of the eighty original members, seven had passed away, and that the society had reason to congratulate itself upon the justification of all its elections. The address consisted mainly of an examination and inquiry into the origin of the two great races which form the Dominion. L'Abbé Casgrain followed with an address on the objects of the several sections. The scope of the papers may be gathered from the following partial list: "The Study of Political Science in Canada;" "Trade and Commerce in the Stone Ages;" "The Cartography of the Gulf of St. Lawrence;" "Nematophytin;" "De Marseilles à Oran, Souvenirs d'Afrique;" "L'Empereur Maximilian du Mexique;" "The Historical Influence of Physical Geography;" "Canadian Pre-Railway Transcontinental Journeys;" "Trilinear Co-ordinates on the Sphere, and Oblique Co-ordinates in Geometry of Three Dimensions;" "A Problem of Political Science;" "Papers on Higher Mathematics;" "The Ore Deposit of the Treadmill Mine, Alaska;" "The Microscopical Character of the said Ore;" "Fossil Sponges from Beds of the Quebec Group of Sir William Logan at Little Metis;" "Copper Deposits of the Sudbury District;" "Geography and Geology of the Big Bend of the Columbia."

On Wednesday evening a public meeting of the French section was held. Principal Grant addressed the audience on "Who are Canadians?" and L'Abbé Casgrain gave an oration on "The Death of Montcalm."